PATENT ABSTRACTS OF JAPAN

(11)Publication number : **2000-325431**
(43)Date of publication of application : **28.11.2000**

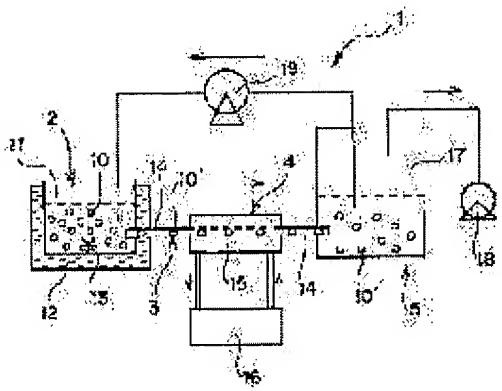
(51)Int.Cl. A61J 3/07
// A61K 9/48
B01J 13/20

(21)Application number : **11-141307**
(22)Date of filing : **21.05.1999**

(71)Applicant : **FREUNT IND CO LTD**
(72)Inventor : **SUGIYAMA MAMORU**

(54) METHOD AND DEVICE FOR MANUFACTURING ASPHERIC CAPSULE

(57)Abstract:
PROBLEM TO BE SOLVED: To manufacture productively high quality aspheric seamless capsules without carrying out a complicated setting and a subtle control.
SOLUTION: Previously manufactured and gelled seamless capsules 10 are made aspheric by batch treatment when necessary. Gelled seamless capsules 10 are put into a heating section 2, heated and solated. Solated seamless capsules 10 are transformed into aspherical capsules through the hose 14 of a deformation section 3. The hose 14 has an inside diameter smaller than the diameter of the capsules. Transformed capsules are cooled in a cooling section 4, gelled, and recovered as aspheric capsules 10' in a recovery section 5.



CLAIMS

[Claim(s)]
[Claim 1] The manufacture approach of the non-globular form capsule characterized by warming the seamless capsule of the gel state, considering as a sol condition, cooling the capsule which is transformed into a non-globular form configuration through the shaping fixture which has the part of a minor diameter for the capsule which changed into said sol condition rather than the path of said capsule, and which deformed into said non-globular form configuration, and considering as the gel state.

[Claim 2] Once dropping the drop which has the encapsulation matter and the coat matter into cooling water and forming the capsule of the gel state, Warm the capsule of said gel state, consider as a sol condition, and the capsule which changed into said sol condition is transformed into a non-globular form configuration through the shaping fixture which has the part of a minor diameter rather than the path of said capsule. The manufacture approach of the non-globular form capsule characterized by cooling the capsule which deformed into said non-globular form configuration, and considering as the gel state.
[Claim 3] The manufacture approach of the non-globular form capsule characterized by being the manufacture approach of a non-globular form capsule according to claim 1 or 2, and said shaping fixture being tubing which has the bore of a minor diameter rather than the path of said capsule.
[Claim 4] The manufacture approach of the non-globular form capsule characterized by being the manufacture approach of a non-globular form capsule according to claim 1 or 2, and said shaping fixture being the die equipped with the converging section of a minor diameter rather than the path of said capsule.
[Claim 5] warming which warms the seamless capsule of the gel state and makes into a sol condition -- the manufacturing installation of the non-globular form capsule characterized by to have the deformation-processing section which makes transform into a non-globular form configuration said capsule which was equipped with the shaping fixture which has the part of a minor diameter rather than the section and the path of said capsule, and changed into a sol condition through said shaping fixture, and the cooling section which cool the capsule by which it was deformed into said non-globular form configuration, and make into the gel state.
[Claim 6] The capsule formation section which trickles the drop which has the encapsulation matter and the coat matter into cooling water, and forms the capsule of the gel state, warming which warms the seamless capsule of said gel state and is made into a sol condition -- with the section The deformation-processing section made to transform into a non-globular form configuration said capsule which was equipped with the shaping fixture which has the part of a minor diameter, and changed into the sol condition from the path of said capsule through said shaping fixture, The manufacturing installation of the non-globular form capsule characterized by having the cooling section which cools the capsule which deformed into said non-globular form configuration, and is made into the gel state.
[Claim 7] The manufacturing installation of the non-globular form capsule characterized by being the manufacturing installation of a non-globular form capsule according to claim 5 or 6, and said shaping fixture being tubing which has the bore of a minor diameter rather than the path of said capsule.
[Claim 8] The manufacturing installation of the non-globular form capsule characterized by being the manufacturing installation of a non-globular form capsule according to claim 5 or 6, and said shaping fixture being the die equipped with the converging section of a minor diameter rather than the path of said capsule.

[Translation done.]
DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] About the manufacturing technology of a non-globular form capsule, especially this invention is applied to a seamless capsule, and relates to an effective technique.
[0002]
[Description of the Prior Art] Conventionally, the so-called seamless capsule is manufactured from the head of a duplex nozzle by the process called the dropping test which the encapsulation matter and the coat matter are made to flow out into cooling water, and encapsulates them. In this dropping test, the drop uses the property which serves as a globular form with that surface tension, and the drop emitted from the nozzle is solidified in the coolant which flows back with constant speed, and serves as a globular form seamless capsule.
[0003] On the other hand, also in such a seamless capsule, non-globular form capsules, such as an ellipse form and an ellipse (OBURONGU form), have been called for in recent years from the request of the improvement in the ease of drinking, or handling nature, or goods differentiation. However, since the above-mentioned dropping test was the manufacture approach using surface tension, only the globular form capsule could be manufactured, but the capsule of an ellipse form was manufactured by the usual sheet method. Then, the approach of forming a capsule in the shape of a Rugby ball and elliptical has been variously proposed like JP,61-17541,B, JP,60-46980,B, and JP,60-46981,B that a seamless non-globular form capsule should be manufactured, using a dropping test.
[0004] In this case, an impression is formed in a drop in a nozzle head, and, thereby, the capsule after dropping coagulation is made to transform in the shape of a Rugby ball in JP,61-17541,B. Moreover, while the drop dropped from the nozzle is in a sol condition, it lets pass and cools in tubing thinner than a drop form, and it is making elliptical solidify a drop in JP,60-46980,B. Furthermore, while the drop dropped from the nozzle is in a sol condition, it lets pass and cools to a drawing-like die, and it is making elliptical solidify a drop in JP,60-46981,B.
[0005]
[Problem(s) to be Solved by the Invention] However, such a manufacture approach of a non-globular form capsule has the following problems, and the improvement was desired. That is, there was a problem that adjustment of the cooling style which forms an impression by the method of JP,60-46980,B first was dramatically delicate, and it was difficult to adjust a cutting style and an impression formation style to the optimal condition. Moreover, whenever this adjustment changed the magnitude and the component of a capsule, it needed to be performed, it was obliged to troublesome tuning in whenever [that], and it was expected that improvement.
[0006] Next, in JP,60-46980,B and JP,60-46981,B, there is a problem that the flow regulation and the temperature control of the coolant of a capsule are difficult. Here, when manufacturing a capsule in the seamless capsule manufacturing installation of a dropping type, the quality (weight, precision, particle size, an oil droplet, degree of thickness deviation) of a capsule has the large place which depends on flow rate (rate of flow) control of the cooling style at the time of capsule manufacture. However, by the method of said official report, in order to let a drop pass to a capillary or a die, pulsation

and plugging are produced with the flow of the coolant by resistance at the time of drop deformation in many cases. Consequently, the quality of the done capsule was not stabilized, but lowering of a volume arose the variation in weight and the thickness deviation of a capsule hide not only arise, but, and there was a problem that industrialization was difficult.

[0007] Moreover, it is cooled by the coolant, and the coating of the shape of a sol dropped from the nozzle serves as gel, and is fabricated with dropping-type equipment. For this reason, the refrigeration capacity which fully cools a sol-like capsule is needed. However, by the method of said official report, while the nozzle outlet temperature (it is about 40-60 degrees C in order to use gelatin etc. as a sol) immediately after making it dropped from a nozzle is high, it is letting it pass to the capillary or the die. Therefore, the temperature control of the coolant is difficult, and since the absolute magnitude of the coolant is not securable, refrigeration capacity is also small. For this reason, while a drop had not fully been gelled, it was collected in many cases, and after recovery, the product returned to the globular form and the problem that a mass production was impossible etc. was.

[0008] In this case, if equipment which loses pulsation is incorporated after lengthening the cooling section of equipment and enabling it to fully cool a drop, or the flow rate and temperature of the coolant are controlled very delicately, it is also possible to solve the above problems. However, the configuration becomes very complicated and equipment which fulfills these conditions does not escape enlargement of equipment itself, either. Moreover, the technique which became skillful also in the actuation is needed.

[0009] The object of this invention is to offer the manufacture approach of a non-globular form capsule and equipment which can manufacture the non-globular form seamless capsule of high quality with sufficient productivity, without performing complicated setting out and delicate control.

[0010]

[Means for Solving the Problem] The manufacture approach of the non-globular form capsule of this invention is characterized by warming the seamless capsule of the gel state, considering as a sol condition, cooling the capsule which is transformed into a non-globular form configuration through the shaping fixture which has the part of a minor diameter for the capsule which changed into said sol condition rather than the path of said capsule and which deformed into said non-globular form configuration, and considering as the gel state.

[0011] By said approach, processing in which it does not conglobate is performed for the capsule which manufactures beforehand, was made to gel and was saved in the stable condition if needed. That is, processing in which it does not conglobate can be carried out in batch processing, after placing several days after capsule manufacture, it can also process, and it is easy to form production planning, and productivity also improves.

[0012] Moreover, each capsule can be warmed to homogeneity, processing in which it does not conglobate can be performed, the variation in the temperature between capsules decreases, and setting out of cooling conditions becomes easy. Furthermore, since the rate of flow in a shaping fixture (flow rate) is stabilized, a deformation processing condition and its control become easy, and it is hard to produce pulsation.

[0013] On the other hand, the manufacture approach of other non-globular form capsules by this invention Once dropping the drop which has the encapsulation matter and the coat

matter into cooling water and forming the capsule of the gel state, It is characterized by warming the capsule of said gel state, considering as a sol condition, cooling the capsule which is transformed into a non-globular form configuration through the shaping fixture which has the part of a minor diameter for the capsule which changed into said sol condition rather than the path of said capsule and which deformed into said non-globular form configuration, and considering as the gel state.

[0014] By the approach by this invention, the capsule which was once gelled unlike the conventional approach is warmed, and processing in which it does not conglobate is performed. For this reason, each capsule can be warmed to homogeneity, the variation in the temperature between capsules decreases, and setting out of cooling conditions becomes easy. Moreover, since processing in which it does not conglobate continues, and is not carried out immediately after capsule manufacture and the rate of flow in a shaping fixture (flow rate) is stabilized, a deformation processing condition and its control become easy, and it is hard to produce pulsation.

[0015] In the above-mentioned approach, tubing which has the bore of a minor diameter rather than the path of said capsule, and the die equipped with the converging section of a minor diameter rather than the path of said capsule can be used as said shaping fixture.

[0016] Next, the manufacturing installation of the non-globular form capsule of this invention warming which warms the seamless capsule of the gel state and is made into a sol condition -- with the section It is characterized by having the deformation-processing section made to transform into a non-globular form configuration said capsule which was equipped with the shaping fixture which has the part of a minor diameter rather than the path of said capsule, and changed into the sol condition through said shaping fixture, and the cooling section which cools the capsule which deformed into said non-globular form configuration, and is made into the gel state.

[0017] With said equipment, since processing in which it does not conglobate can be performed for the capsule which manufactures beforehand, was made to gel and was saved in the stable condition if needed, processing in which it does not conglobate can be carried out in batch processing. Therefore, it can also process, after placing several days after capsule manufacture, and it is easy to form production planning, and productivity also improves.

[0018] moreover, warming -- since processing in which it does not conglobate can be performed after warming each capsule to homogeneity in the section, the variation in the temperature between capsules decreases and setting out of cooling conditions becomes easy. Furthermore, since the rate of flow in a shaping fixture (flow rate) is stabilized, a deformation processing condition and its control become easy, and it is hard to produce pulsation.

[0019] On the other hand, the manufacturing installation of other non-globular form capsules by this invention The capsule formation section which trickles the drop which has the encapsulation matter and the coat matter into cooling water, and forms the capsule of the gel state, warming which warms the seamless capsule of said gel state and is made into a sol condition -- with the section It is characterized by having the deformation-processing section made to transform into a non-globular form configuration said capsule which was equipped with the shaping fixture which has the part of a minor diameter rather than the path of said capsule, and changed into the sol condition through said shaping fixture, and the cooling section which cools the capsule which deformed into

said non-globular form configuration, and is made into the gel state.
[0020] the capsule which was once gelled with the equipment by this invention unlike conventional equipment -- warming -- after holding in the section and warming, processing in which it does not conglobate is performed. For this reason, each capsule can be warmed to homogeneity, the variation in the temperature between capsules decreases, and setting out of cooling conditions becomes easy. Moreover, since processing in which it does not conglobate continues and is not carried out immediately after capsule manufacture, the rate of flow in a shaping fixture (flow rate) is stabilized, a deformation processing condition and its control become easy, and it is hard to produce pulsation.
[0021] In the above-mentioned equipment, tubing which has the bore of a minor diameter rather than the path of said capsule, and the die equipped with the converging section of a minor diameter rather than the path of said capsule can be used as said shaping fixture.
[0022]
[Embodiment of the Invention] (Gestalt 1 of operation) The gestalt of operation of this invention is hereafter explained to a detail based on a drawing. The explanatory view showing the system configuration of the non-globular form capsule manufacturing installation whose drawing 1 is the gestalt 1 of operation of this invention, the perspective view of the non-globular form capsule manufacturing installation which drawing 2 equipped with the system of drawing 1 , and drawing 3 are the explanatory views showing the internal configuration of the equipment of drawing 2 .
[0023] The non-globular form capsule manufacturing installation 1 by this invention is made to deform into non-globular form capsules, such as an ellipse, after warming the globular form seamless capsule which solidifies and has become the gel state and considering as a sol or a half-sol condition. namely, the globular form seamless capsule (it is hereafter written as a capsule) 10 which is in the gel state with the equipment 1 concerned -- warming -- capsule 10' of a non-globular form is obtained by the stripping section 5 by advancing processing with the deformation-processing section 3 and the cooling section 4 as a sol condition in the section 2.
[0024] then, warming which holds the capsule 10 of the gel state in equipment 1 as the 1st step first, and is warmed and solated to predetermined temperature -- the section 2 is formed. warming -- it was shown in the section 2 drawing 1 -3 -- as -- warming -- a tub 11 prepares -- having -- **** -- a capsule 10 -- vegetable oil -- this warming -- it holds in a tub 11. in this case, a capsule 10 and vegetable oil -- in general -- the rate of 4:1-3:1 -- warming -- it is supplied in a tub 11 and agitated by the magnet-type stirrer 13.
[0025] the capsule 10 which manufactures beforehand, was made to gel with the equipment 1 concerned, and was saved in the stable condition here -- the need -- responding -- warming -- it supplies to a tub 11 and processing in which it does not conglobate is performed. For this reason, if the equipment by this invention is applied, it will become possible to keep spacing of about four days and to perform processing in which it does not conglobate, after capsule manufacture. Therefore, it becomes possible to carry out batch processing of un-conglobating [of a capsule], and becomes easy to construct production planning, and improvement in productivity can be aimed at.
[0026] warming -- the warm water jacket 12 is arranged in the outside of a tub 11, and the temperature of the water in it can be adjusted now at the heater which is not illustrated. and this warm water jacket 12 -- warming -- the inside of a tub 11 is warmed

by predetermined temperature (for example, 15-30 degrees C), and the capsule 10 of the gel state held in the tub is solated.
[0027] warming -- the latter part of the section 2 -- warming -- the deformation-processing section 3 which transforms into a non-globular form configuration the capsule 10 which changed into the sol condition within the tub 11 is formed. The hose 14 which has a bore smaller than the path of a capsule 10 as a shaping fixture is formed in the deformation-processing section 3. This hose 14 is formed with the synthetic resin which has flexibility, such as polypropylene, and Teflon, a vinyl chloride, and with a product, although there is no ******** generally, about [overall-length 5-20m] tubing is used for a bore by phi4-6mm, for example. In addition, it is also possible to replace with this hose 14 and to use a glass tube, an iron pipe, stainless steel tubing, etc.
[0028] the end side of a hose 14 -- warming -- in the tub 11, opening is carried out, it is installed, and a capsule 10 is introduced in a hose 14 with vegetable oil from there. under the present circumstances, the capsule 10 -- warming -- since it changed into the sol condition and has softened within a tub 11, it enters in a hose 14, a capsule 10 deforming into a minor diameter in the edge of a hose 14. And it is un-conglobated by the shape of an ellipse ball, and ellipse spherical **, a capsule 10 moving after that in the inside of a hose 14.
[0029] In this case, if the hose 14 which is a shaping fixture is suitably exchanged with the equipment 1 concerned according to a product, it is possible to manufacture the non-globular form capsule of various sizes. Therefore, in the non-globular form capsule manufacturing installation 1 concerned, it is also possible to obtain two or more kinds of non-globular form capsules from one kind of globular form capsule only by exchange of a hose 14.
[0030] In addition, as a shaping fixture, what established the part of a bore smaller than a capsule 10 in some tubing of a major diameter may be used not only from tubing which has the bore of homogeneity but from the capsule 10. Drawing 4 is the example of such a shaping fixture. The converging section 22 of a bore smaller than a capsule 10 is formed in some hose 21, and the non-globular form is made then, to transform a capsule 10 into it here.
[0031] The cooling section 4 is further formed in the latter part of the deformation-processing section 3. The cooling pool 15 is arranged in the cooling section 4, and the hose 14 passes along the inside of it. That is, in the cooling section 4, it is cooled in the state of a refrigerant and non-contact, and the capsule 10 in a hose 14 is solidified. a cooling pool 15 connects with the cooling system 16 having the cooling function and feeding function of a refrigerant -- having -- **** -- the interior -- warming -- it is set up so that it may become temperature (for example, about -10-15 degrees C) lower about 10 degrees C than the temperature in a tub 11. And by this cooling pool 15, it is cooled in the condition of having deformed into the non-globular form configuration, a capsule 10 is gelled, and non-globular form capsule 10' is done.
[0032] here -- the equipment 1 concerned -- warming -- the solation temperature in a tub 11 -- the temperature at the time of capsule manufacture -- low (15-30 degrees C) -- moreover, warming -- processing is performed by not continuation but batch processing. Therefore, each capsule is warmed by homogeneity and the variation in the temperature between capsules decreases. For this reason, count of refrigeration capacity, such as cooling temperature in a cooling pool 15 and the die length of a hose 14, becomes easy.

Moreover, since the rate of flow in a hose 14 (flow rate) is stabilized, a deformation processing condition and its control are not only simplified, but it is hard coming to also generate problems, such as pulsation. Consequently, it becomes possible to obtain the non-globular form capsule by which quality (weight precision, particle size, an oil droplet, degree of thickness deviation) was stabilized, without requiring the skilled technique.

[0033] Capsule 10' gelled in the cooling section 4 is collected by the stripping section 5 prepared in the latter part of the cooling section 4. The collection tank 17 is arranged in the stripping section 5, the end of a hose 14 carries out opening to the interior, and capsule 10' is emitted in a collection tank 17 from there. In this case, the collection tank 17 is formed in the sealing condition, and the vacuum pump 18 is connected there. and this vacuum pump 18 -- the inside of a collection tank 17 -- a vacua -- carrying out -- warming -- the capsule 10 in a tub 11 is attracted in a hose 14 with vegetable oil. The capsule 10 of a sol condition is transformed into a non-globular form as mentioned above by this, and it becomes capsule 10', and is drawn in a collection tank 17. in addition, the vegetable oil in a collection tank 17 -- a gear pump 19 -- warming -- the cyclic use of waste water is returned and carried out to a tub 11.

[0034] the non-globular form capsule manufacturing installation 1 which consists of such a configuration -- first -- warming -- the capsule 10 gelled in the tub 11 is thrown in with vegetable oil. warming -- in a tub 11, this capsule 10 is warmed and extent to which they can deform and enter in a hose 14 is softened. That is, a capsule 10 is warmed at 15-30 degrees C, and it considers as a sol or a half-sol condition. And a vacuum pump 18 is operated in the place where the capsule 10 changed into such a condition. Thereby, in a hose 14, the softened capsule 10 is attracted one after another, moves in the inside of it and goes.

[0035] The capsule 10 in a hose 14 moves deforming according to the bore of a hose 14, and results in a cooling pool 15. At this time, it is cooled while moving in the inside of a cooling pool 15, and a capsule 10 is gelled. And the gelled capsule 10 is drawn in a collection tank 17, and are collected. under the present circumstances, the vegetable oil collected simultaneously -- a gear pump 19 -- warming -- it is returned to a tub 11.

[0036] (Gestalt 2 of operation) Next, the system which connected the non-globular form capsule manufacturing installation 1 by this invention to the capsule manufacturing installation as a gestalt 2 of operation is explained. Drawing 5 is the explanatory view showing the system configuration of the non-globular form capsule manufacturing installation which is the gestalt 2 of operation of this invention. In addition, the sign same about the same part as the gestalt 1 of operation is attached, and the detail is omitted.

[0037] The system concerned has the composition of having formed separately the capsule manufacturing installation (capsule formation section) 31 and the non-globular form capsule manufacturing installation 1, and having connected them continuously. Here, the equipment by the dropping test better known than the former which used the duplex nozzle 32 as a capsule manufacturing installation 31 is used. That is, in the capsule manufacturing installation 31, the encapsulation matter 33 and the coat matter 34 are dropped from the duplex nozzle 32 into the coolant 35 which flows back with constant speed. And the drop is gelled on the cooling pipe way 36 where the coolant 35 flows back, and congeals, and the globular form seamless capsule 10 is formed.

[0038] thus, warming of the non-globular form capsule manufacturing installation 1 in

which the once gelled capsule 10 was formed to serve also as the product stripping section of the capsule manufacturing installation 31 -- a tub 11 is supplied. and the capsule 10 -- the gestalt 1 of operation -- the same -- warming -- processing in which it does not conglobate should do as the deformation-processing section 3 and the cooling section 4 from the section 2 -- it becomes capsule 10' of a non-globular form, and is brought together in a stripping section 5.

[0039] the capsule 10 which once gelled the non-globular form capsule manufacturing installation 1 of this invention also in this case unlike conventional equipment -- warming -- it brings together in a tub 11 and processing in which it does not conglobate is performed. for this reason, warming -- the solation temperature in the section 2 becomes lower than the temperature at the time of capsule manufacture, and can also carry out processing in which it does not conglobate to batch processing. Therefore, each capsule is warmed by homogeneity, the variation in the temperature between capsules decreases, and count of refrigeration capacity, such as cooling temperature in a cooling pool 15 and the die length of a hose 14, becomes easy.

[0040] Moreover, since processing in which it does not conglobate continues and is not carried out immediately after capsule manufacture, the rate of flow in a hose 14 (flow rate) is stabilized, a deformation processing condition and its control are simplified, and it is hard coming to also generate pulsation. Consequently, in order to obtain the non-globular form capsule by which quality (weight precision, particle size, an oil droplet, degree of thickness deviation) was stabilized, the technique which became skillful like conventional equipment is not needed, but it becomes possible to attain the increase in efficiency of a manufacture process.

[0041]

[Example] Next, the experimental result at the time of performing actually processing of a seamless capsule in which it does not conglobate, in the equipment of the gestalt 1 of operation is explained. Drawing 6 is the table showing the experiment conditions in that case, and drawing 7 is the table which summarized the experimental result.

[0042] As shown in drawing 7 , any sample was able to transform the globular form capsule into the non-globular form capsule of an ellipse form. Under the present circumstances, in processing in which it does not conglobate, it turned out that the temperature conditions of each process are important. and the most important conditions -- warming -- it has checked that it was the temperature of the capsule 10 in the section 2, and conditions important for a degree were the temperature in the cooling section 4. in this case, warming -- if the temperature of the section 2 is low, blocking will be produced at the entry of a hose 14 and it will become the cause of a crack or variation generating. moreover -- although it changes also with die length of a burst size or a hose 14 -- warming -- it also turned out that 10 degrees C of temperature gradients of the section 2 and the cooling section 4 are required.

[0043] As mentioned above, although invention made by this invention person was concretely explained based on the gestalt of operation, it cannot be overemphasized that it can change variously in the range which this invention is not limited to the gestalt of said operation, and does not deviate from the summary.

[0044] For example, besides vegetable oil, although the gestalt 1 of operation showed the example which supplies vegetable oil with a capsule 10, if a liquid paraffin, straight mineral oil, etc. are the matter which the coat of a capsule 10 does not dissolve, it is also

possible to use other matter suitably. Moreover, it is not necessary to cover an overall length and to consider as a uniform bore, a bore is formed in the shape of a taper, a path is gradually made small, and you may make it the above-mentioned hose 14 also go. Furthermore, although the gestalt 2 of operation showed the system which formed separately the capsule manufacturing installation 31 and the non-globular form capsule manufacturing installation 1, and was connected, of course, it is also possible to unify these and to consider as one equipment.

[0045] In addition, in the gestalt of the above-mentioned operation, although the example which carries out processing in which it does not conglobate was shown by making the capsule of the gel state into a sol condition, it is not necessary to necessarily solate a capsule thoroughly. That is, the so-called thing [processing in the state of a half-sol] is [that what is necessary is just to have softened in extent which a capsule can let pass to a shaping fixture] also possible.

[0046]

[Effect of the Invention] According to the manufacture approach of the non-globular form capsule of this invention, and equipment, the capsule in the gel state is warmed and it becomes possible to make a non-globular form configuration un-conglobate the capsule of the gel state which manufactured beforehand and was saved if needed as a sol condition, since it cools and he is trying to obtain a non-globular form capsule, deformation and. Therefore, processing in which it does not conglobate can be performed in batch processing, planning of production planning becomes easy, and improvement in productivity can also be aimed at.

[0047] Moreover, since a capsule can be warmed to homogeneity by batch processing and processing in which it does not conglobate can be performed, the variation in the temperature between capsules decreases and setting out of cooling conditions becomes easy. Furthermore, since the rate of flow in a shaping fixture (flow rate) is stabilized, a deformation processing condition and its control become easy, and it is hard to produce pulsation. Therefore, it becomes possible to obtain the non-globular form capsule by which quality was stabilized, without requiring the skilled technique.

[0048] On the other hand, with the manufacture approach of other non-globular form capsules and equipment by this invention, once forming the capsule of the gel state, a capsule is warmed, as a sol condition, deformation and since it cools and he is trying to obtain a non-globular form capsule, it becomes possible to warm a capsule to homogeneity, the variation in the temperature between capsules decreases, and setting out of cooling conditions becomes easy at a non-globular form configuration. Moreover, since processing in which it does not conglobate continues and is not carried out immediately after capsule manufacture, the rate of flow in a shaping fixture (flow rate) is stabilized, a deformation processing condition and its control become easy, and it is hard to produce pulsation. Therefore, it becomes possible to obtain the non-globular form capsule by which quality was stabilized, without requiring the skilled technique.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] About the manufacturing technology of a non-globular form capsule, especially this invention is applied to a seamless capsule, and relates to an effective technique.

[Translation done.]
ART

[Description of the Prior Art] Conventionally, the so-called seamless capsule is manufactured from the head of a duplex nozzle by the process called the dropping test which the encapsulation matter and the coat matter are made to flow out into cooling water, and encapsulates them. In this dropping test, the drop uses the property which serves as a globular form with that surface tension, and the drop emitted from the nozzle is solidified in the coolant which flows back with constant speed, and serves as a globular form seamless capsule.

[0003] On the other hand, also in such a seamless capsule, non-globular form capsules, such as an ellipse form and an ellipse (OBURONGU form), have been called for in recent years from the request of the improvement in the ease of drinking, or handling nature, or goods differentiation. However, since the above-mentioned dropping test was the manufacture approach using surface tension, only the globular form capsule could be manufactured, but the capsule of an ellipse form was manufactured by the usual sheet method. Then, the approach of forming a capsule in the shape of a Rugby ball and elliptical has been variously proposed like JP,61-17541,B, JP,60-46980,B, and JP,60-46981,B that a seamless non-globular form capsule should be manufactured, using a dropping test.

[0004] In this case, an impression is formed in a drop in a nozzle head, and, thereby, the capsule after dropping coagulation is made to transform in the shape of a Rugby ball in JP,61-17541,B. Moreover, while the drop dropped from the nozzle is in a sol condition, it lets pass and cools in tubing thinner than a drop form, and it is making elliptical solidify a drop in JP,60-46980,B. Furthermore, while the drop dropped from the nozzle is in a sol condition, it lets pass and cools to a drawing-like die, and it is making elliptical solidify a drop in JP,60-46981,B.

[Translation done.]
EFFECT OF THE INVENTION

[Effect of the Invention] According to the manufacture approach of the non-globular form capsule of this invention, and equipment, the capsule in the gel state is warmed and it becomes possible to make a non-globular form configuration un-conglobate the capsule of the gel state which manufactured beforehand and was saved if needed as a sol condition, since it cools and he is trying to obtain a non-globular form capsule, deformation and. Therefore, processing in which it does not conglobate can be performed in batch processing, planning of production planning becomes easy, and improvement in

productivity can also be aimed at.
[0047] Moreover, since a capsule can be warmed to homogeneity by batch processing and processing in which it does not conglobate can be performed, the variation in the temperature between capsules decreases and setting out of cooling conditions becomes easy. Furthermore, since the rate of flow in a shaping fixture (flow rate) is stabilized, a deformation processing condition and its control become easy, and it is hard to produce pulsation. Therefore, it becomes possible to obtain the non-globular form capsule by which quality was stabilized, without requiring the skilled technique.
[0048] On the other hand, with the manufacture approach of other non-globular form capsules and equipment by this invention, once forming the capsule of the gel state, a capsule is warmed, as a sol condition, deformation and since it cools and he is trying to obtain a non-globular form capsule, it becomes possible to warm a capsule to homogeneity, the variation in the temperature between capsules decreases, and setting out of cooling conditions becomes easy at a non-globular form configuration. Moreover, since processing in which it does not conglobate continues and is not carried out immediately after capsule manufacture, the rate of flow in a shaping fixture (flow rate) is stabilized, a deformation processing condition and its control become easy, and it is hard to produce pulsation. Therefore, it becomes possible to obtain the non-globular form capsule by which quality was stabilized, without requiring the skilled technique.

[Translation done.]
TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, such a manufacture approach of a non-globular form capsule has the following problems, and the improvement was desired. That is, there was a problem that adjustment of the cooling style which forms an impression by the method of JP,60-46980,B first was dramatically delicate, and it was difficult to adjust a cutting style and an impression formation style to the optimal condition. Moreover, whenever this adjustment changed the magnitude and the component of a capsule, it needed to be performed, it was obliged to troublesome tuning in whenever [that], and it was expected that improvement.
[0006] Next, in JP,60-46980,B and JP,60-46981,B, there is a problem that the flow regulation and the temperature control of the coolant of a capsule are difficult. Here, when manufacturing a capsule in the seamless capsule manufacturing installation of a dropping type, the quality (weight, precision, particle size, an oil droplet, degree of thickness deviation) of a capsule has the large place which depends on flow rate (rate of flow) control of the cooling style at the time of capsule manufacture. However, by the method of said official report, in order to let a drop pass to a capillary or a die, pulsation and plugging are produced with the flow of the coolant by resistance at the time of drop deformation in many cases. Consequently, the quality of the done capsule was not stabilized, but lowering of a volume arose the variation in weight and the thickness deviation of a capsule hide not only arise, but, and there was a problem that industrialization was difficult.
[0007] Moreover, it is cooled by the coolant, and the coating of the shape of a sol

dropped from the nozzle serves as gel, and is fabricated with dropping-type equipment. For this reason, the refrigeration capacity which fully cools a sol-like capsule is needed. However, by the method of said official report, while the nozzle outlet temperature (it is about 40-60 degrees C in order to use gelatin etc. as a sol) immediately after making it dropped from a nozzle is high, it is letting it pass to the capillary or the die. Therefore, the temperature control of the coolant is difficult, and since the absolute magnitude of the coolant is not securable, refrigeration capacity is also small. For this reason, while a drop had not fully been gelled, it was collected in many cases, and after recovery, the product returned to the globular form and the problem that a mass production was impossible etc. was.

[0008] In this case, if equipment which loses pulsation is incorporated after lengthening the cooling section of equipment and enabling it to fully cool a drop, or the flow rate and temperature of the coolant are controlled very delicately, it is also possible to solve the above problems. However, the configuration becomes very complicated and equipment which fulfills these conditions does not escape enlargement of equipment itself, either. Moreover, the technique which became skillful also in the actuation is needed.

[0009] The object of this invention is to offer the manufacture approach of a non-globular form capsule and equipment which can manufacture the non-globular form seamless capsule of high quality with sufficient productivity, without performing complicated setting out and delicate control.

[Translation done.]
MEANS

[Means for Solving the Problem] The manufacture approach of the non-globular form capsule of this invention is characterized by warming the seamless capsule of the gel state, considering as a sol condition, cooling the capsule which is transformed into a non-globular form configuration through the shaping fixture which has the part of a minor diameter for the capsule which changed into said sol condition rather than the path of said capsule and which deformed into said non-globular form configuration, and considering as the gel state.

[0011] By said approach, processing in which it does not conglobate is performed for the capsule which manufactures beforehand, was made to gel and was saved in the stable condition if needed. That is, processing in which it does not conglobate can be carried out in batch processing, after placing several days after capsule manufacture, it can also process, and it is easy to form production planning, and productivity also improves.

[0012] Moreover, each capsule can be warmed to homogeneity, processing in which it does not conglobate can be performed, the variation in the temperature between capsules decreases, and setting out of cooling conditions becomes easy. Furthermore, since the rate of flow in a shaping fixture (flow rate) is stabilized, a deformation processing condition and its control become easy, and it is hard to produce pulsation.

[0013] On the other hand, the manufacture approach of other non-globular form capsules by this invention Once dropping the drop which has the encapsulation matter and the coat matter into cooling water and forming the capsule of the gel state, It is characterized by

warming the capsule of said gel state, considering as a sol condition, cooling the capsule which is transformed into a non-globular form configuration through the shaping fixture which has the part of a minor diameter for the capsule which changed into said sol condition rather than the path of said capsule and which deformed into said non-globular form configuration, and considering as the gel state.

[0014] By the approach by this invention, the capsule which was once gelled unlike the conventional approach is warmed, and processing in which it does not conglobate is performed. For this reason, each capsule can be warmed to homogeneity, the variation in the temperature between capsules decreases, and setting out of cooling conditions becomes easy. Moreover, since processing in which it does not conglobate continues, and is not carried out immediately after capsule manufacture and the rate of flow in a shaping fixture (flow rate) is stabilized, a deformation processing condition and its control become easy, and it is hard to produce pulsation.

[0015] In the above-mentioned approach, tubing which has the bore of a minor diameter rather than the path of said capsule, and the die equipped with the converging section of a minor diameter rather than the path of said capsule can be used as said shaping fixture.

[0016] Next, the manufacturing installation of the non-globular form capsule of this invention warming which warms the seamless capsule of the gel state and is made into a sol condition -- with the section It is characterized by having the deformation-processing section made to transform into a non-globular form configuration said capsule which was equipped with the shaping fixture which has the part of a minor diameter rather than the path of said capsule, and changed into the sol condition through said shaping fixture, and the cooling section which cools the capsule which deformed into said non-globular form configuration, and is made into the gel state.

[0017] With said equipment, since processing in which it does not conglobate can be performed for the capsule which manufactures beforehand, was made to gel and was saved in the stable condition if needed, processing in which it does not conglobate can be carried out in batch processing. Therefore, it can also process, after placing several days after capsule manufacture, and it is easy to form production planning, and productivity also improves.

[0018] moreover, warming -- since processing in which it does not conglobate can be performed after warming each capsule to homogeneity in the section, the variation in the temperature between capsules decreases and setting out of cooling conditions becomes easy. Furthermore, since the rate of flow in a shaping fixture (flow rate) is stabilized, a deformation processing condition and its control become easy, and it is hard to produce pulsation.

[0019] On the other hand, the manufacturing installation of other non-globular form capsules by this invention The capsule formation section which trickles the drop which has the encapsulation matter and the coat matter into cooling water, and forms the capsule of the gel state, warming which warms the seamless capsule of said gel state and is made into a sol condition -- with the section It is characterized by having the deformation-processing section made to transform into a non-globular form configuration said capsule which was equipped with the shaping fixture which has the part of a minor diameter rather than the path of said capsule, and changed into the sol condition through said shaping fixture, and the cooling section which cools the capsule which deformed into said non-globular form configuration, and is made into the gel state.

[0020] the capsule which was once gelled with the equipment by this invention unlike conventional equipment -- warming -- after holding in the section and warming, processing in which it does not conglobate is performed. For this reason, each capsule can be warmed to homogeneity, the variation in the temperature between capsules decreases, and setting out of cooling conditions becomes easy. Moreover, since processing in which it does not conglobate continues and is not carried out immediately after capsule manufacture, the rate of flow in a shaping fixture (flow rate) is stabilized, a deformation processing condition and its control become easy, and it is hard to produce pulsation.
[0021] In the above-mentioned equipment, tubing which has the bore of a minor diameter rather than the path of said capsule, and the die equipped with the converging section of a minor diameter rather than the path of said capsule can be used as said shaping fixture.
[0022]
[Embodiment of the Invention] (Gestalt 1 of operation) The gestalt of operation of this invention is hereafter explained to a detail based on a drawing. The explanatory view showing the system configuration of the non-globular form capsule manufacturing installation whose drawing 1 is the gestalt 1 of operation of this invention, the perspective view of the non-globular form capsule manufacturing installation which drawing 2 equipped with the system of drawing 1 , and drawing 3 are the explanatory views showing the internal configuration of the equipment of drawing 2 .
[0023] The non-globular form capsule manufacturing installation 1 by this invention is made to deform into non-globular form capsules, such as an ellipse, after warming the globular form seamless capsule which solidifies and has become the gel state and considering as a sol or a half-sol condition. namely, the globular form seamless capsule (it is hereafter written as a capsule) 10 which is in the gel state with the equipment 1 concerned -- warming -- capsule 10' of a non-globular form is obtained by the stripping section 5 by advancing processing with the deformation-processing section 3 and the cooling section 4 as a sol condition in the section 2.
[0024] then, warming which holds the capsule 10 of the gel state in equipment 1 as the 1st step first, and is warmed and solated to predetermined temperature -- the section 2 is formed. warming -- it was shown in the section 2 drawing 1 -3 -- as -- warming -- a tub 11 prepares -- having -- **** -- a capsule 10 -- vegetable oil -- this warming -- it holds in a tub 11. in this case, a capsule 10 and vegetable oil -- in general -- the rate of 4:1-3:1 -- warming -- it is supplied in a tub 11 and agitated by the magnet-type stirrer 13.
[0025] the capsule 10 which manufactures beforehand, was made to gel with the equipment 1 concerned, and was saved in the stable condition here -- the need -- responding -- warming -- it supplies to a tub 11 and processing in which it does not conglobate is performed. For this reason, if the equipment by this invention is applied, it will become possible to keep spacing of about four days and to perform processing in which it does not conglobate, after capsule manufacture. Therefore, it becomes possible to carry out batch processing of un-conglobating [of a capsule], and becomes easy to construct production planning, and improvement in productivity can be aimed at.
[0026] warming -- the warm water jacket 12 is arranged in the outside of a tub 11, and the temperature of the water in it can be adjusted now at the heater which is not illustrated. and this warm water jacket 12 -- warming -- the inside of a tub 11 is warmed by predetermined temperature (for example, 15-30 degrees C), and the capsule 10 of the

gel state held in the tub is solated.
[0027] warming -- the latter part of the section 2 -- warming -- the deformation-processing section 3 which transforms into a non-globular form configuration the capsule 10 which changed into the sol condition within the tub 11 is formed. The hose 14 which has a bore smaller than the path of a capsule 10 as a shaping fixture is formed in the deformation-processing section 3. This hose 14 is formed with the synthetic resin which has flexibility, such as polypropylene, and Teflon, a vinyl chloride, and with a product, although there is no ******** generally, about [overall-length 5-20m] tubing is used for a bore by phi4-6mm, for example. In addition, it is also possible to replace with this hose 14 and to use a glass tube, an iron pipe, stainless steel tubing, etc.
[0028] the end side of a hose 14 -- warming -- in the tub 11, opening is carried out, it is installed, and a capsule 10 is introduced in a hose 14 with vegetable oil from there. under the present circumstances, the capsule 10 -- warming -- since it changed into the sol condition and has softened within a tub 11, it enters in a hose 14, a capsule 10 deforming into a minor diameter in the edge of a hose 14. And it is un-conglobated by the shape of an ellipse ball, and ellipse spherical **, a capsule 10 moving after that in the inside of a hose 14.
[0029] In this case, if the hose 14 which is a shaping fixture is suitably exchanged with the equipment 1 concerned according to a product, it is possible to manufacture the non-globular form capsule of various sizes. Therefore, in the non-globular form capsule manufacturing installation 1 concerned, it is also possible to obtain two or more kinds of non-globular form capsules from one kind of globular form capsule only by exchange of a hose 14.
[0030] In addition, as a shaping fixture, what established the part of a bore smaller than a capsule 10 in some tubing of a major diameter may be used not only from tubing which has the bore of homogeneity but from the capsule 10. Drawing 4 is the example of such a shaping fixture. The converging section 22 of a bore smaller than a capsule 10 is formed in some hose 21, and the non-globular form is made then, to transform a capsule 10 into it here.
[0031] The cooling section 4 is further formed in the latter part of the deformation-processing section 3. The cooling pool 15 is arranged in the cooling section 4, and the hose 14 passes along the inside of it. That is, in the cooling section 4, it is cooled in the state of a refrigerant and non-contact, and the capsule 10 in a hose 14 is solidified. a cooling pool 15 connects with the cooling system 16 having the cooling function and feeding function of a refrigerant -- having -- **** -- the interior -- warming -- it is set up so that it may become temperature (for example, about -10-15 degrees C) lower about 10 degrees C than the temperature in a tub 11. And by this cooling pool 15, it is cooled in the condition of having deformed into the non-globular form configuration, a capsule 10 is gelled, and non-globular form capsule 10' is done.
[0032] here -- the equipment 1 concerned -- warming -- the solation temperature in a tub 11 -- the temperature at the time of capsule manufacture -- low (15-30 degrees C) -- moreover, warming -- processing is performed by not continuation but batch processing. Therefore, each capsule is warmed by homogeneity and the variation in the temperature between capsules decreases. For this reason, count of refrigeration capacity, such as cooling temperature in a cooling pool 15 and the die length of a hose 14, becomes easy. Moreover, since the rate of flow in a hose 14 (flow rate) is stabilized, a deformation

processing condition and its control are not only simplified, but it is hard coming to also generate problems, such as pulsation. Consequently, it becomes possible to obtain the non-globular form capsule by which quality (weight precision, particle size, an oil droplet, degree of thickness deviation) was stabilized, without requiring the skilled technique.

[0033] Capsule 10' gelled in the cooling section 4 is collected by the stripping section 5 prepared in the latter part of the cooling section 4. The collection tank 17 is arranged in the stripping section 5, the end of a hose 14 carries out opening to the interior, and capsule 10' is emitted in a collection tank 17 from there. In this case, the collection tank 17 is formed in the sealing condition, and the vacuum pump 18 is connected there. and this vacuum pump 18 -- the inside of a collection tank 17 -- a vacua -- carrying out -- warming -- the capsule 10 in a tub 11 is attracted in a hose 14 with vegetable oil. The capsule 10 of a sol condition is transformed into a non-globular form as mentioned above by this, and it becomes capsule 10', and is drawn in a collection tank 17. in addition, the vegetable oil in a collection tank 17 -- a gear pump 19 -- warming -- the cyclic use of waste water is returned and carried out to a tub 11.

[0034] the non-globular form capsule manufacturing installation 1 which consists of such a configuration -- first -- warming -- the capsule 10 gelled in the tub 11 is thrown in with vegetable oil. warming -- in a tub 11, this capsule 10 is warmed and extent to which they can deform and enter in a hose 14 is softened. That is, a capsule 10 is warmed at 15-30 degrees C, and it considers as a sol or a half-sol condition. And a vacuum pump 18 is operated in the place where the capsule 10 changed into such a condition. Thereby, in a hose 14, the softened capsule 10 is attracted one after another, moves in the inside of it and goes.

[0035] The capsule 10 in a hose 14 moves deforming according to the bore of a hose 14, and results in a cooling pool 15. At this time, it is cooled while moving in the inside of a cooling pool 15, and a capsule 10 is gelled. And the gelled capsule 10 is drawn in a collection tank 17, and are collected. under the present circumstances, the vegetable oil collected simultaneously -- a gear pump 19 -- warming -- it is returned to a tub 11.

[0036] (Gestalt 2 of operation) Next, the system which connected the non-globular form capsule manufacturing installation 1 by this invention to the capsule manufacturing installation as a gestalt 2 of operation is explained. Drawing 5 is the explanatory view showing the system configuration of the non-globular form capsule manufacturing installation which is the gestalt 2 of operation of this invention. In addition, the sign same about the same part as the gestalt 1 of operation is attached, and the detail is omitted.

[0037] The system concerned has the composition of having formed separately the capsule manufacturing installation (capsule formation section) 31 and the non-globular form capsule manufacturing installation 1, and having connected them continuously. Here, the equipment by the dropping test better known than the former which used the duplex nozzle 32 as a capsule manufacturing installation 31 is used. That is, in the capsule manufacturing installation 31, the encapsulation matter 33 and the coat matter 34 are dropped from the duplex nozzle 32 into the coolant 35 which flows back with constant speed. And the drop is gelled on the cooling pipe way 36 where the coolant 35 flows back, and congeals, and the globular form seamless capsule 10 is formed.

[0038] thus, warming of the non-globular form capsule manufacturing installation 1 in which the once gelled capsule 10 was formed to serve also as the product stripping

section of the capsule manufacturing installation 31 -- a tub 11 is supplied. and the capsule 10 -- the gestalt 1 of operation -- the same -- warming -- processing in which it does not conglobate should do as the deformation-processing section 3 and the cooling section 4 from the section 2 -- it becomes capsule 10' of a non-globular form, and is brought together in a stripping section 5.

[0039] the capsule 10 which once gelled the non-globular form capsule manufacturing installation 1 of this invention also in this case unlike conventional equipment -- warming -- it brings together in a tub 11 and processing in which it does not conglobate is performed. for this reason, warming -- the solation temperature in the section 2 becomes lower than the temperature at the time of capsule manufacture, and can also carry out processing in which it does not conglobate to batch processing. Therefore, each capsule is warmed by homogeneity, the variation in the temperature between capsules decreases, and count of refrigeration capacity, such as cooling temperature in a cooling pool 15 and the die length of a hose 14, becomes easy.

[0040] Moreover, since processing in which it does not conglobate continues and is not carried out immediately after capsule manufacture, the rate of flow in a hose 14 (flow rate) is stabilized, a deformation processing condition and its control are simplified, and it is hard coming to also generate pulsation. Consequently, in order to obtain the non-globular form capsule by which quality (weight precision, particle size, an oil droplet, degree of thickness deviation) was stabilized, the technique which became skillful like conventional equipment is not needed, but it becomes possible to attain the increase in efficiency of a manufacture process.

[Translation done.]

EXAMPLE

[Example] Next, the experimental result at the time of performing actually processing of a seamless capsule in which it does not conglobate, in the equipment of the gestalt 1 of operation is explained. Drawing 6 is the table showing the experiment conditions in that case, and drawing 7 is the table which summarized the experimental result.

[0042] As shown in drawing 7 , any sample was able to transform the globular form capsule into the non-globular form capsule of an ellipse form. Under the present circumstances, in processing in which it does not conglobate, it turned out that the temperature conditions of each process are important. and the most important conditions -- warming -- it has checked that it was the temperature of the capsule 10 in the section 2, and conditions important for a degree were the temperature in the cooling section 4. in this case, warming -- if the temperature of the section 2 is low, blocking will be produced at the entry of a hose 14 and it will become the cause of a crack or variation generating. moreover -- although it changes also with die length of a burst size or a hose 14 -- warming -- it also turned out that 10 degrees C of temperature gradients of the section 2 and the cooling section 4 are required.

[0043] As mentioned above, although invention made by this invention person was concretely explained based on the gestalt of operation, it cannot be overemphasized that it can change variously in the range which this invention is not limited to the gestalt of said

operation, and does not deviate from the summary.
[0044] For example, besides vegetable oil, although the gestalt 1 of operation showed the example which supplies vegetable oil with a capsule 10, if a liquid paraffin, straight mineral oil, etc. are the matter which the coat of a capsule 10 does not dissolve, it is also possible to use other matter suitably. Moreover, it is not necessary to cover an overall length and to consider as a uniform bore, a bore is formed in the shape of a taper, a path is gradually made small, and you may make it the above-mentioned hose 14 also go. Furthermore, although the gestalt 2 of operation showed the system which formed separately the capsule manufacturing installation 31 and the non-globular form capsule manufacturing installation 1, and was connected, of course, it is also possible to unify these and to consider as one equipment.
[0045] In addition, in the gestalt of the above-mentioned operation, although the example which carries out processing in which it does not conglobate was shown by making the capsule of the gel state into a sol condition, it is not necessary to necessarily solate a capsule thoroughly. That is, the so-called thing [processing in the state of a half-sol] is [that what is necessary is just to have softened in extent which a capsule can let pass to a shaping fixture] also possible.

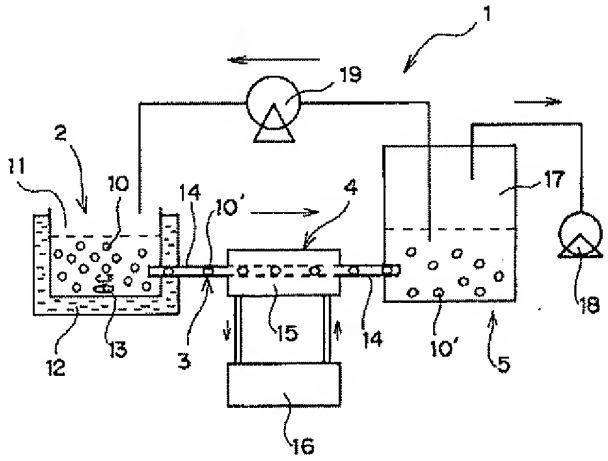
[Translation done.]
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the explanatory view showing the system configuration of the non-globular form capsule manufacturing installation which is the gestalt 1 of operation of this invention.
[Drawing 2] It is the perspective view of the non-globular form capsule manufacturing installation equipped with the system of drawing 1 .
[Drawing 3] It is the explanatory view showing the internal configuration of the equipment of drawing 2 .
[Drawing 4] It is the explanatory view showing the example of a complete-change form of a shaping fixture.
[Drawing 5] It is the explanatory view showing the system configuration of the non-globular form capsule manufacturing installation which is the gestalt 2 of operation of this invention.
[Drawing 6] It is the table showing the experiment conditions of an example.
[Drawing 7] It is the table which summarized the experimental result.
[Description of Notations]
1 Non-Globular Form Capsule Manufacturing Installation
2 Warming -- Section
3 Deformation-Processing Section
4 Cooling Section
5 Stripping Section
10 Seamless Capsule
10' Non-globular form capsule

11 Warming -- Tub
12 Warm Water Jacket
13 Stirrer
14 Hose
15 Cooling Pool
16 Cooling System
17 Collection Tank
18 Vacuum Pump
19 Gear Pump
21 Hose
22 Converging Section
31 Capsule Manufacturing Installation
32 Duplex Nozzle
33 Encapsulation Matter
34 Coat Matter
35 Coolant
36 Cooling Pipe Way

[Translation done.]

図　1



1：非球形カプセル製造装置
2：加温部
3：変形加工部
4：冷却部
10：シームレスカプセル
10'：非球形カプセル
14：ホース

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2000－325431
（P2000－325431A）
(43)公開日　平成12年11月28日(2000.11.28)

(51)Int.Cl.'	識別記号	ＦＩ		テーマコード'（参考）
Ａ６１Ｊ　3/07		Ａ６１Ｊ	3/07	Ｌ　４Ｃ０７６
// Ａ６１Ｋ　9/48		Ａ６１Ｋ	9/48	４Ｇ００５
Ｂ０１Ｊ　13/20		Ｂ０１Ｊ	13/02	Ｋ

審査請求　未請求　請求項の数８　ＯＬ　（全８頁）

(21)出願番号　特願平11－141307

(22)出願日　平成11年５月21日(1999.5.21)

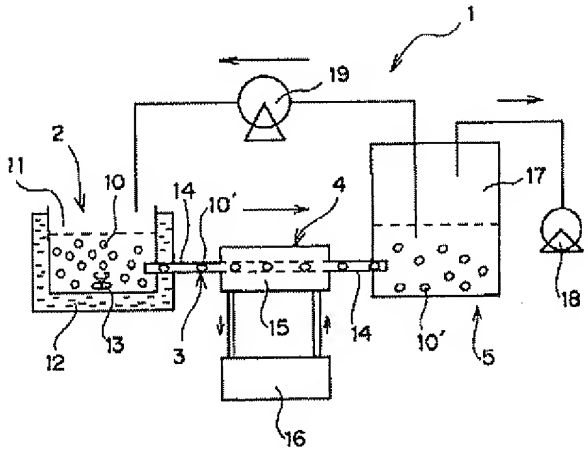
(71)出願人　000112912
フロイント産業株式会社
東京都新宿区高田馬場２丁目14番２号
(72)発明者　杉山　守
東京都新宿区高田馬場２丁目14番２号　フロイント産業株式会社内
(74)代理人　100080001
弁理士　筒井　大和　（外２名）

Ｆターム(参考)　4C076 AA57 BB01 EE42H FF21
4G005 AA01 AB14 AB30 BB13 BB21
CA01 DB06Z EA01 EA03

(54)【発明の名称】　非球形カプセルの製造方法および製造装置

(57)【要約】
【課題】　煩雑な設定や微妙な制御を行うことなく、高品質の非球形シームレスカプセルを生産性良く製造する。
【解決手段】　予め製造しゲル化させたシームレスカプセル１０を必要に応じてバッチ処理にて非球形化する。ゲル状態のシームレスカプセル１０を加温部２に収容して加温しゾル化する。ゾル状態となったシームレスカプセル１０を変形加工部３のホース１４を通して非球形形状に変形させる。ホース１４は、カプセル径よりも小径の内径を有する。変形処理されたカプセルは冷却部４にて冷却されてゲル状態とされ、回収部５にて非球形カプセル１０'として回収される。

図　1



1：非球形カプセル製造装置
2：加温部
3：変形加工部
4：冷却部
10：シームレスカプセル
10'：非球形カプセル
14：ホース

【特許請求の範囲】
【請求項１】　ゲル状態のシームレスカプセルを加温してゾル状態とし、前記ゾル状態となったカプセルを前記カプセルの径よりも小径の部位を有する成形治具を通して非球形形状に変形し、前記非球形形状に変形されたカプセルを冷却してゲル状態とすることを特徴とする非球形カプセルの製造方法。
【請求項２】　カプセル充填物質と皮膜物質とを有する液滴を冷却水中に滴下してゲル状態のカプセルを一旦形成した後、前記ゲル状態のカプセルを加温してゾル状態とし、前記ゾル状態となったカプセルを前記カプセルの径よりも小径の部位を有する成形治具を通して非球形形状に変形し、前記非球形形状に変形されたカプセルを冷却してゲル状態とすることを特徴とする非球形カプセルの製造方法。
【請求項３】　請求項１または２記載の非球形カプセルの製造方法であって、前記成形治具が、前記カプセルの径よりも小径の内径を有する管であることを特徴とする非球形カプセルの製造方法。
【請求項４】　請求項１または２記載の非球形カプセルの製造方法であって、前記成形治具が、前記カプセルの径よりも小径の絞り部を備えた成形型であることを特徴とする非球形カプセルの製造方法。
【請求項５】　ゲル状態のシームレスカプセルを加温してゾル状態とする加温部と、
前記カプセルの径よりも小径の部位を有する成形治具を備え、ゾル状態となった前記カプセルを前記成形治具を通して非球形形状に変形させる変形加工部と、
前記非球形形状に変形されたカプセルを冷却してゲル状態とする冷却部とを有することを特徴とする非球形カプセルの製造装置。
【請求項６】　カプセル充填物質と皮膜物質とを有する液滴を冷却水中に滴下してゲル状態のカプセルを形成するカプセル形成部と、
前記ゲル状態のシームレスカプセルを加温してゾル状態とする加温部と、
前記カプセルの径よりも小径の部位を有する成形治具を備え、ゾル状態となった前記カプセルを前記成形治具を通して非球形形状に変形させる変形加工部と、
前記非球形形状に変形されたカプセルを冷却してゲル状態とする冷却部とを有することを特徴とする非球形カプセルの製造装置。
【請求項７】　請求項５または６記載の非球形カプセルの製造装置であって、前記成形治具が、前記カプセルの径よりも小径の内径を有する管であることを特徴とする非球形カプセルの製造装置。
【請求項８】　請求項５または６記載の非球形カプセルの製造装置であって、前記成形治具が、前記カプセルの径よりも小径の絞り部を備えた成形型であることを特徴とする非球形カプセルの製造装置。

【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、非球形カプセルの製造技術に関し、特に、シームレスカプセルに適用して有効な技術に関するものである。
【０００２】
【従来の技術】従来より、いわゆるシームレスカプセルは、二重ノズルの先端からカプセル充填物質と皮膜物質を冷却水中に流出させてカプセル化する滴下法と呼ばれる製法によって製造されている。この滴下法では、液滴がその表面張力によって球形となる性質を利用しており、ノズルから放出された液滴は一定速度で還流する冷却液中で凝固し、球形のシームレスカプセルとなる。
【０００３】一方、このようなシームレスカプセルにおいても、近年、飲み易さや取り扱い性の向上、あるいは商品差別化等の要請から、楕円形や長円形（オブロング形）等の非球形カプセルが求められてきた。ところが、前述の滴下法は表面張力を利用した製造方法であるため球形カプセルしか製造できず、楕円形のカプセルは通常のシート方式で製造されていた。そこで、シームレスの非球形カプセルを製造すべく、特公昭６１－１７５４１号公報や特公昭６０－４６９８０号公報、特公昭６０－４６９８１号公報などのように、滴下法を用いつつカプセルをラグビーボール状あるいは楕円形状に形成する方法が種々提案されてきた。
【０００４】この場合、特公昭６１－１７５４１号公報では、ノズル先端において液滴にくぼみを形成し、これにより滴下凝固後のカプセルをラグビーボール状に変形させている。また、特公昭６０－４６９８０号公報では、ノズルから滴下された液滴がゾル状態にある間に液滴形より細い管に通して冷却し、液滴を楕円形状に凝固させている。さらに、特公昭６０－４６９８１号公報では、ノズルから滴下された液滴がゾル状態にある間に絞り状の成形型に通して冷却し、液滴を楕円形状に凝固させている。
【０００５】
【発明が解決しようとする課題】しかしながら、このような非球形カプセルの製造方法は、次のような問題がありその改善が望まれていた。すなわち、まず特公昭６０－４６９８０号公報の方式では、くぼみを形成する冷却流の調整が非常に微妙であり、切断流とくぼみ形成流を最適な状態に調整するのが難しいという問題があった。また、この調整は、カプセルの大きさや成分を変えるたびに行う必要があり、そのたびに煩わしい調整作業を余儀なくされ、その改善が望まれていた。
【０００６】次に、特公昭６０－４６９８０号公報および特公昭６０－４６９８１号公報では、カプセルの冷却液の流量調節や温度コントロールが難しいという問題がある。ここで、滴下式のシームレスカプセル製造装置にてカプセルを製造する場合、カプセルの品質（重量、精

度、粒径、油滴、偏肉の度合い）は、カプセル製造時の冷却流の流量（流速）コントロールに依るところが大きい。ところが、前記公報の方式では、液滴を細管や成形型に通すため、液滴変形時の抵抗により冷却液の流れに脈動や詰まりを生じることが多い。この結果、出来上がったカプセルの品質が安定せず、重量のバラツキや、カプセル剤皮の偏肉が生じるのみならず、生産量の低下が生じ、工業化が難しいという問題があった。

【０００７】また、滴下式の装置では、ノズルより滴下されたゾル状の剤皮が冷却液によって冷却され、ゲル状となり成形される。このため、ゾル状のカプセルを十分に冷却する冷却能力が必要となる。ところが、前記公報の方式では、ノズルより滴下させた直後のノズル出口温度（ゼラチンなどをゾルとして使用するため４０～６０℃程度）が高い間に細管や成形型に通している。従って、冷却液の温度コントロールが難しく、また、冷却液の絶対量が確保できないため冷却能力も小さい。このため、液滴が十分にゲル化されないまま回収されることが多く、回収後に製品が球形に戻ってしまったり、連続生産ができないなどの問題があった。

【０００８】この場合、装置の冷却部を長くして液滴を十分に冷却できるようにした上で、脈動をなくすような装置を組み込むか、冷却液の流量や温度をきわめて精緻に制御すれば前述のような問題を改善することも可能である。しかしながら、かかる条件を満たすような装置は、その構成が非常に複雑となり、装置自体の大型化も免れない。また、その操作においても熟練した技術が必要となる。

【０００９】本発明の目的は、煩雑な設定や微妙な制御を行うことなく、高品質の非球形シームレスカプセルを生産性良く製造し得る非球形カプセルの製造方法および装置を提供することにある。

【００１０】

【課題を解決するための手段】本発明の非球形カプセルの製造方法は、ゲル状態のシームレスカプセルを加温してゾル状態とし、前記ゾル状態となったカプセルを前記カプセルの径よりも小径の部位を有する成形治具を通して非球形形状に変形し、前記非球形形状に変形されたカプセルを冷却してゲル状態とすることを特徴としている。

【００１１】前記方法では、予め製造しゲル化させて安定な状態で保存しておいたカプセルを、必要に応じて非球形化処理を行う。すなわち、バッチ処理にて非球形化処理を実施でき、カプセル製造後に数日置いてから処理を行うこともでき、生産計画が立て易く、生産性も向上する。

【００１２】また、個々のカプセルを均一に加温して非球形化処理を行うことができ、カプセル間の温度のバラツキが少なくなり、冷却条件の設定が容易となる。さらに、成形治具内における流速（流量）が安定するため、変形処理条件やそのコントロールが容易となり、脈動も生じにくい。

【００１３】一方、本発明による他の非球形カプセルの製造方法は、カプセル充填物質と皮膜物質とを有する液滴を冷却水中に滴下してゲル状態のカプセルを一旦形成した後、前記ゲル状態のカプセルを加温してゾル状態とし、前記ゾル状態となったカプセルを前記カプセルの径よりも小径の部位を有する成形治具を通して非球形形状に変形し、前記非球形形状に変形されたカプセルを冷却してゲル状態とすることを特徴としている。

【００１４】本発明による方法では、従来の方法と異なり一旦ゲル化したカプセルを加温して非球形化処理を行う。このため、個々のカプセルを均一に加温でき、カプセル間の温度のバラツキが少なくなり、冷却条件の設定が容易となる。また、非球形化処理がカプセル製造直後に連続して実施されないため、成形治具内における流速（流量）が安定するため、変形処理条件やそのコントロールが容易となり、脈動も生じにくい。

【００１５】前述の方法においては、前記成形治具として、前記カプセルの径よりも小径の内径を有する管や、前記カプセルの径よりも小径の絞り部を備えた成形型を用いることができる。

【００１６】次に、本発明の非球形カプセルの製造装置は、ゲル状態のシームレスカプセルを加温してゾル状態とする加温部と、前記カプセルの径よりも小径の部位を有する成形治具を備え、ゾル状態となった前記カプセルを前記成形治具を通して非球形形状に変形させる変形加工部と、前記非球形形状に変形されたカプセルを冷却してゲル状態とする冷却部とを有することを特徴としている。

【００１７】前記装置では、予め製造しゲル化させて安定な状態で保存しておいたカプセルを、必要に応じて非球形化処理を行うことができるため、バッチ処理にて非球形化処理を実施できる。従って、カプセル製造後に数日置いてから処理を行うこともでき、生産計画が立て易く、生産性も向上する。

【００１８】また、加温部において個々のカプセルを均一に加温した後に非球形化処理を行うことができるため、カプセル間の温度のバラツキが少なくなり、冷却条件の設定が容易となる。さらに、成形治具内における流速（流量）が安定するため、変形処理条件やそのコントロールが容易となり、脈動も生じにくい。

【００１９】一方、本発明による他の非球形カプセルの製造装置は、カプセル充填物質と皮膜物質とを有する液滴を冷却水中に滴下してゲル状態のカプセルを形成するカプセル形成部と、前記ゲル状態のシームレスカプセルを加温してゾル状態とする加温部と、前記カプセルの径よりも小径の部位を有する成形治具を備え、ゾル状態となった前記カプセルを前記成形治具を通して非球形形状に変形させる変形加工部と、前記非球形形状に変形され

たカプセルを冷却してゲル状態とする冷却部とを有することを特徴としている。

【００２０】本発明による装置では、従来の装置と異なり一旦ゲル化したカプセルを加温部に収容して加温した後、非球形化処理を行う。このため、個々のカプセルを均一に加温でき、カプセル間の温度のバラツキが少なくなり、冷却条件の設定が容易となる。また、非球形化処理がカプセル製造直後に連続して実施されないため、成形治具内における流速（流量）が安定し、変形処理条件やそのコントロールが容易となり、脈動も生じにくい。

【００２１】前述の装置においては、前記成形治具として、前記カプセルの径よりも小径の内径を有する管や、前記カプセルの径よりも小径の絞り部を備えた成形型を用いることができる。

【００２２】

【発明の実施の形態】（実施の形態１）以下、本発明の実施の形態を図面に基づいて詳細に説明する。図１は、本発明の実施の形態１である非球形カプセル製造装置のシステム構成を示す説明図、図２は図１のシステムを備えた非球形カプセル製造装置の斜視図、図３は図２の装置の内部構成を示す説明図である。

【００２３】本発明による非球形カプセル製造装置１は、凝固してゲル状態となっている球形のシームレスカプセルを加温してゾル若しくは半ゾル状態とした上で、長円形等の非球形カプセルに変形させるようになっている。すなわち、当該装置１ではゲル状態にある球形のシームレスカプセル（以下、カプセルと略記する）１０を、加温部２にてゾル状態として変形加工部３、冷却部４と処理を進めることにより、回収部５にて非球形のカプセル１０’が得られるようになっている。

【００２４】そこで、装置１にはまず第１段階として、ゲル状態のカプセル１０を収容し、所定温度に加温してゾル化する加温部２が設けられている。加温部２には、図１～３に示したように加温槽１１が設けられており、カプセル１０は植物オイルと共にこの加温槽１１内に収容される。この場合、カプセル１０と植物オイルは、概ね４：１～３：１の割合で加温槽１１内に投入され、マグネット式の撹拌器１３によって撹拌される。

【００２５】ここで、当該装置１では、予め製造しゲル化させて安定な状態で保存しておいたカプセル１０を、必要に応じて加温槽１１に投入して非球形化処理を行う。このため本発明による装置を適用すれば、カプセル製造後に４日程度の間隔を置いて非球形化処理を行うことが可能となる。従って、カプセルの非球形化をバッチ処理することが可能となり、生産計画が組み易くなり生産性の向上を図ることができる。

【００２６】加温槽１１の外側には温水ジャケット１２が配設されており、図示しないヒータによりその中の水の温度を調節できるようになっている。そして、この温水ジャケット１２によって加温槽１１内が所定温度（例えば、１５～３０℃）に加温され、槽内に収容されたゲル状態のカプセル１０がゾル化される。

【００２７】加温部２の後段には、加温槽１１内にてゾル状態となったカプセル１０を非球形形状に変形する変形加工部３が設けられている。変形加工部３には、成形治具として、カプセル１０の径よりも小さな内径を有するホース１４が設けられている。このホース１４は、ポリプロピレンやテフロン、塩化ビニル等の可撓性を有する合成樹脂によって形成されており、製品によって一概には定め得ないが、例えば、内径がφ４～６㎜で全長５～２０m程度の管が用いられる。なお、このホース１４に代えて、ガラス管や鉄管、ステンレス管等を用いることも可能である。

【００２８】ホース１４の一端側は、加温槽１１内に開口して設置されており、そこからカプセル１０が植物オイルと共にホース１４内に導入される。この際、カプセル１０は加温槽１１内にてゾル状態となって軟化しているため、カプセル１０はホース１４の端部において小径に変形されつつホース１４内に入り込む。そして、カプセル１０は、その後ホース１４内を移動しつつ長円球状や楕円球状等に非球形化される。

【００２９】この場合、当該装置１では、製品に応じて適宜、成形治具であるホース１４を交換すれば種々のサイズの非球形カプセルを製造することが可能である。従って、当該非球形カプセル製造装置１では、ホース１４の交換だけで１種類の球形カプセルから複数種類の非球形カプセルを得ることも可能である。

【００３０】なお、成形治具としては、均一の内径を有する管のみならず、カプセル１０より大径の管の一部に、カプセル１０より小さな内径の部位を設けたものを用いても良い。図４は、そのような成形治具の例である。ここではホース２１の一部に、カプセル１０より小さな内径の絞り部２２を形成し、そこでカプセル１０を非球形に変形させている。

【００３１】変形加工部３の後段にはさらに冷却部４が設けられている。冷却部４には冷却槽１５が配設されており、その中をホース１４が通っている。すなわち、冷却部４においては、ホース１４内のカプセル１０は冷媒と非接触状態で冷却されて固化されるようになっている。冷却槽１５は、冷媒の冷却機能と送給機能を併せ持った冷却装置１６と接続されており、その内部は加温槽１１内の温度よりも１０℃ほど低い温度（例えば－１０～１５℃程度）になるように設定されている。そして、この冷却槽１５により、カプセル１０は非球形形状に変形された状態で冷却されてゲル化し、非球形カプセル１０’が出来上がる。

【００３２】ここで当該装置１では、加温槽１１におけるゾル化温度がカプセル製造時の温度よりも低く（１５～３０℃）、また、加温処理が連続ではなくバッチ処理によって行われる。従って、個々のカプセルが均一に加

温され、カプセル間の温度のバラツキが少なくなる。このため、冷却槽１５での冷却温度やホース１４の長さ等の冷却能力の計算が容易となる。また、ホース１４内の流速（流量）が安定するため、変形処理条件やそのコントロールが簡素化されるのみならず、脈動などの問題も生じにくくなる。この結果、熟練した技術を要することなく、品質（重量精度、粒径、油滴、偏肉の度合い）の安定した非球形カプセルを得ることが可能となる。

【００３３】冷却部４にてゲル化されたカプセル１０'は、冷却部４の後段に設けられた回収部５にて回収される。回収部５には回収槽１７が配設されており、ホース１４の一端がその内部に開口し、そこからカプセル１０'が回収槽１７内に放出される。この場合、回収槽１７は密閉状態に形成されており、そこには真空ポンプ１８が接続されている。そして、この真空ポンプ１８により回収槽１７内を真空状態とし、加温槽１１内のカプセル１０を植物オイルと共にホース１４内に吸引する。これにより、前述のようにゾル状態のカプセル１０が非球形に変形されてカプセル１０'となり回収槽１７へと引き込まれる。なお、回収槽１７中の植物オイルは、ギアポンプ１９により加温槽１１に戻され循環使用されるようになっている。

【００３４】このような構成からなる非球形カプセル製造装置１では、まず、加温槽１１内にゲル化したカプセル１０が植物油と共に投入される。加温槽１１では、このカプセル１０を加温し、それらがホース１４内に変形して入り込める程度に軟化させる。すなわち、カプセル１０を１５～３０℃に加温してゾル若しくは半ゾル状態とする。そして、カプセル１０がこのような状態となったところで、真空ポンプ１８を作動させる。これにより、軟化したカプセル１０はホース１４内に次々に吸引され、その中を移動して行く。

【００３５】ホース１４内のカプセル１０は、ホース１４の内径に合わせて変形されつつ移動し冷却槽１５に至る。このとき、カプセル１０は冷却槽１５内を移動中に冷却されてゲル化する。そして、ゲル化したカプセル１０は、回収槽１７に引き込まれ回収される。この際、同時に回収される植物オイルはギアポンプ１９により加温槽１１に戻される。

【００３６】（実施の形態２）次に、実施の形態２として、本発明による非球形カプセル製造装置１をカプセル製造装置に接続したシステムを説明する。図５は、本発明の実施の形態２である非球形カプセル製造装置のシステム構成を示す説明図である。なお、実施の形態１と同様の部分については同一の符号を付しその詳細は省略する。

【００３７】当該システムは、カプセル製造装置（カプセル形成部）３１と非球形カプセル製造装置１を別途形成してそれらを連続的に接続した構成となっている。ここでは、カプセル製造装置３１として、二重ノズル３２を用いた従来より公知の滴下法による装置が用いられている。すなわち、カプセル製造装置３１では、二重ノズル３２から、カプセル充填物質３３と皮膜物質３４とが、一定速度で還流する冷却液３５中に滴下される。そして、その液滴が、冷却液３５が還流する冷却管路３６にてゲル化されて凝固し、球形のシームレスカプセル１０が形成される。

【００３８】このようにして一旦ゲル化されたカプセル１０は、カプセル製造装置３１の製品回収部を兼ねて設けられた、非球形カプセル製造装置１の加温槽１１に供給される。そして、カプセル１０は、実施の形態１と同様に、加温部２から変形加工部３、冷却部４と非球形化処理がなされ、非球形のカプセル１０'となって回収部５に集められる。

【００３９】この場合も、従来の装置と異なり、本発明の非球形カプセル製造装置１は、一旦ゲル化したカプセル１０を加温槽１１に集めて非球形化処理を行う。このため、加温部２におけるゾル化温度はカプセル製造時の温度よりも低くなり、また、非球形化処理もバッチ処理に行うことができる。従って、個々のカプセルが均一に加温され、カプセル間の温度のバラツキが少なくなり、冷却槽１５での冷却温度やホース１４の長さ等の冷却能力の計算が容易となる。

【００４０】また、非球形化処理がカプセル製造直後に連続して実施されないため、ホース１４内の流速（流量）が安定し、変形処理条件やそのコントロールが簡素化され、脈動も生じにくくなる。この結果、品質（重量精度、粒径、油滴、偏肉の度合い）の安定した非球形カプセルを得るために、従来の装置のように熟練した技術は必要とされず、製造過程の効率化を図ることが可能となる。

【００４１】

【実施例】次に、実施の形態１の装置において実際にシームレスカプセルの非球形化処理を行った際の実験結果について説明する。図６はその際の実験条件を示す表であり、図７は実験結果をまとめた表である。

【００４２】図７に示したように、何れのサンプルでも球形のカプセルを楕円形の非球形カプセルに変形することができた。この際、非球形化処理においては、各工程の温度条件が重要であることが分かった。そして、最も重要な条件は、加温部２におけるカプセル１０の温度であり、次に重要な条件は冷却部４における温度であることが確認できた。この場合、加温部２の温度が低いとホース１４の入り口にてブロッキングを生じ、割れやバラツキ発生の原因となる。また、生産数やホース１４の長さによっても異なるが、加温部２と冷却部４との温度差が１０℃必要であることも分かった。

【００４３】以上、本発明者によってなされた発明を実施の形態に基づき具体的に説明したが、本発明は前記実施の形態に限定されるものではなく、その要旨を逸脱し

ない範囲で種々変更可能であることはいうまでもない。

【００４４】たとえば、実施の形態１では、カプセル１０と共に植物オイルを投入する例を示したが、植物オイル以外にも、例えば、流動パラフィンや鉱物油など、カプセル１０の皮膜が溶解しない物質であれば適宜他の物質を用いることも可能である。また、前述のホース１４も、全長に亘って均一な内径とする必要はなく、内径をテーパー状に形成して徐々に径を小さくして行くようにしても良い。さらに、実施の形態２では、カプセル製造装置３１と非球形カプセル製造装置１を別途形成して接続したシステムを示したが、これらを一体化してひとつの装置とすることも勿論可能である。

【００４５】なお、前述の実施の形態においては、ゲル状態のカプセルをゾル状態として非球形化処理する例を示したが、カプセルを必ずしも完全にゾル化する必要はない。すなわち、カプセルが成形治具に通せる程度に軟化していれば良く、いわゆる半ゾル状態にて処理を行うことも可能である。

【００４６】

【発明の効果】本発明の非球形カプセルの製造方法および装置によれば、ゲル状態にあるカプセルを加温してゾル状態として非球形形状に変形、冷却して非球形カプセルを得るようにしているため、予め製造して保存しておいたゲル状態のカプセルを、必要に応じて非球形化させることが可能となる。従って、非球形化処理をバッチ処理にて行うことができ、生産計画の立案が容易となり、生産性の向上も図ることができる。

【００４７】また、バッチ処理によりカプセルを均一に加温して非球形化処理を行うことができるため、カプセル間の温度のバラツキが少なくなり、冷却条件の設定が容易となる。さらに、成形治具内における流速（流量）が安定するため、変形処理条件やそのコントロールが容易となり、脈動も生じにくい。従って、熟練した技術を要することなく、品質の安定した非球形カプセルを得ることが可能となる。

【００４８】一方、本発明による他の非球形カプセルの製造方法および装置では、ゲル状態のカプセルを一旦形成した後、カプセルを加温してゾル状態として非球形形状に変形、冷却して非球形カプセルを得るようにしているため、カプセルを均一に加温することが可能となり、カプセル間の温度のバラツキが少なくなり、冷却条件の設定が容易となる。また、非球形化処理がカプセル製造直後に連続して実施されないため、成形治具内における流速（流量）が安定し、変形処理条件やそのコントロールが容易となり、脈動も生じにくい。従って、熟練した技術を要することなく、品質の安定した非球形カプセルを得ることが可能となる。

【図面の簡単な説明】

【図１】本発明の実施の形態１である非球形カプセル製造装置のシステム構成を示す説明図である。

【図２】図１のシステムを備えた非球形カプセル製造装置の斜視図である。

【図３】図２の装置の内部構成を示す説明図である。

【図４】成形治具の一変形例を示す説明図である。

【図５】本発明の実施の形態２である非球形カプセル製造装置のシステム構成を示す説明図である。

【図６】実施例の実験条件を示す表である。

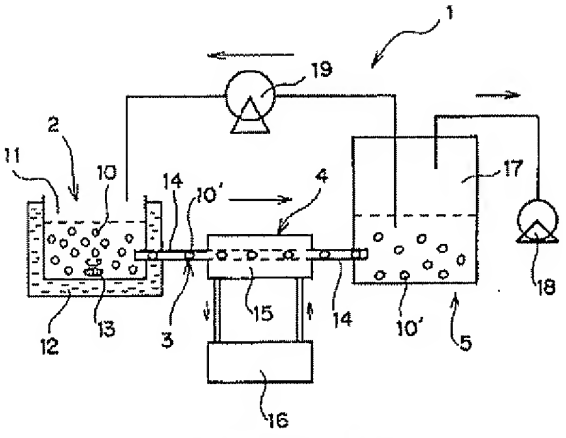
【図７】実験結果をまとめた表である。

【符号の説明】

１　非球形カプセル製造装置
２　加温部
３　変形加工部
４　冷却部
５　回収部
１０　シームレスカプセル
１０'　非球形カプセル
１１　加温槽
１２　温水ジャケット
１３　撹拌器
１４　ホース
１５　冷却槽
１６　冷却装置
１７　回収槽
１８　真空ポンプ
１９　ギアポンプ
２１　ホース
２２　絞り部
３１　カプセル製造装置
３２　二重ノズル
３３　カプセル充填物質
３４　皮膜物質
３５　冷却液
３６　冷却管路

【図1】

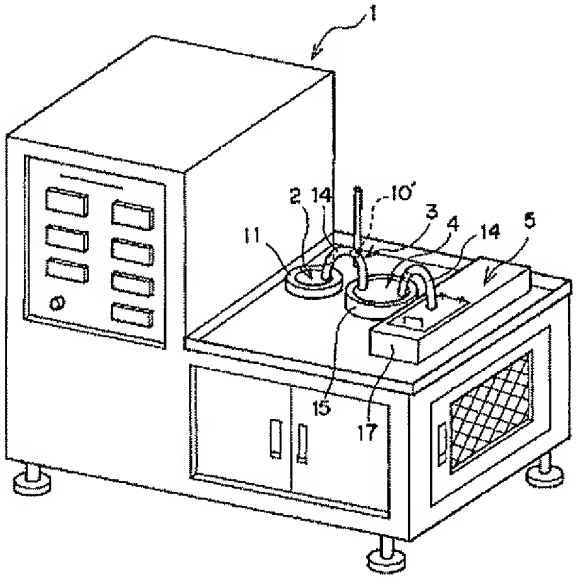
図 1



1:非球形カプセル製造装置
2:加温部
3:変形加工部
4:冷却部
10:シームレスカプセル
10':非球形カプセル
14:ホース

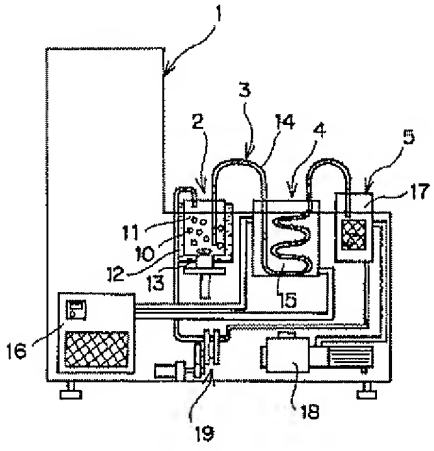
【図2】

図 2



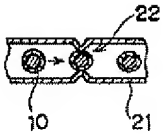
【図3】

図 3



【図4】

図 4



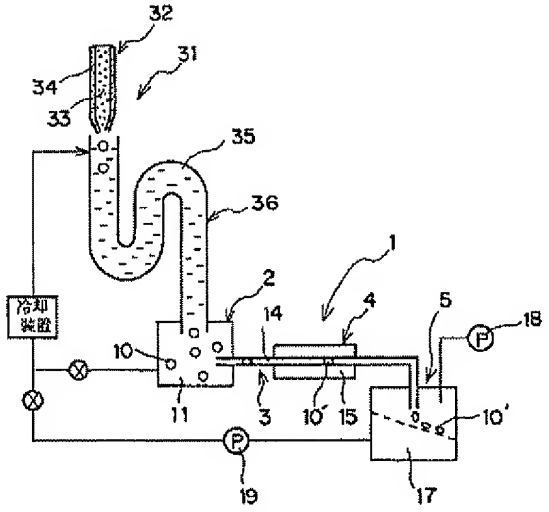
【図7】

図 7

実験番号	実験結果
0 1	5.0mmφ→7×4mm
0 2	7.0mmφ→9×6mm
0 3	8.5mmφ→9×5mm

【図5】

図 5



【図6】

図 6

実験番号				01	02	03
供給原料	生カプセル	形態		2重タイプ	2重タイプ	2重タイプ
		粒径(mmφ)		5.0	9.0	7.6
		処方	芯物質	MCT	MCT	MCT
			被膜物質	ゼラチン	ゼラチン	ゼラチン
		皮膜率(%)		62	55	59
		被膜固形分(%)		25	30	30
		保冷期間(2℃)		4日間	1時間	1時間
	植物オイル			MCT	MCT	MCT
	割合(生カプセル:オイル)			4:1	4:1	4:1
実験条件	加温部	温度(℃)		23	28	25
		速度(cm/sec)		7	7	7
	変形加工部	管径(mmφ)		4	6	6
		長さ(m)		2	5	5
	冷却部	温度		−5	5	3
		時間		20	40	40
	生産数			3	3	3
	回収部温度			15	5	15